IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Norihiro Yamaguchi.

Appln. No. 10/594,587 Group Art Unit: 1797
Examiner: MCKANE, ELIZABETH L

Filed: 04/22/2008

For: INK COMPOSITION FOR SENSING GAS EXPOSURE AND GAS EXPOSURE

Commissioner of Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. Section 1.132

I, Seisaku OSHIRO, do hereby declare that:

1. I am a Japanese citizen, residing at 9-21-203, Katsuyamakita 2-chome, Ikuno-ku, Osaka, Japan.

2. I graduated from the School of Applied Chemistry, Faculty of Science and Engineering, Kinki University, Osaka, Japan in March 1995. I also graduated from the Graduate School of Kinki University, Osaka, Japan and received the degree of Master of Applied Chemistry in March 1997.

3. I began my employment with SAKURA COLOR PRODUCTS CORPORATION, the assignee of the above-identified application, in April 2003. Since April 2003, I have been engaged in the research and development of discoloration ink.

4. I am familiar with the subject matter of said application, as well as the disclosures in the cited references.

5. The experiments given below were carried out under my general direction and supervision.

Experiments

Purpose of Experiments

An object of the experiments is to show that an ink composition undergoes a sufficient color change upon exposure to both ozone and hydrogen peroxide gas only when the ink composition comprises a combination of a cationic surfactant and at least one member selected from the group consisting of azo dye, methine dye, triarylmethane dye and thiazine dye.

Comparative Experimental Examples 1 to 5

Ink compositions were prepared in the same manner as in Examples 1, 3, 4, 5 and 8, except that a surfactant (NIKKOL CA-2150) was not added. Table 1 below shows the composition of each ink composition. The details of each component in Table 1 are as described in the present specification.

The obtained ink compositions were examined in accordance with Test Examples 1-1 and 1-2 below.

Test Example 1-1

The color-changing properties of the ink compositions obtained in each example in response to ozone were investigated. Each ink composition was printed onto a PET film by silk screen printing (350 mesh). The printed film was exposed to ozone under the conditions of a CT value of 5,200 ppm·min with an ozone generator, and a humidity of 90%. The change in color of the samples following treatment was observed visually. The results are shown in Table 1.

Test Example 1-2

The color-changing properties of the ink compositions obtained in each example in response to hydrogen peroxide gas were investigated. Each ink composition

was printed onto a PET film by silk screen printing (350 mesh). Seventy five μL of 30% hydrogen peroxide was dropped into a sealed container at 18,000 ppm·min under reduced pressure at 40°C, and the printed film was exposed to that atmosphere for 6 hours. The change in color of the samples following exposure was observed visually. The results are shown in Table 1.

Table 1 below also contains the results of Examples 1, 3, 4, 5 and 8 of the present specification.

Table 1

Composition	Example 1	Comparative Experiment 1	Example 3	Comparative Experiment 2	Example 4	Comparative Experiment 3
C.I. Basic Red 14 (methine dye)	0.5	0.5				
C.I. Disperse Orange 13 (azo dye)			0.5	0.5		
C.I. Basic Blue 9 (thiazine dye)					0.5	0.5
Bersamide 756	10.0	10.0	10.0	10.0	10.0	10.0
Denka Butyral #2000-L						
Nikkol CA-2150	1.0		1.0		1.0	
Butyl Cellusorb	68.5	69.5	68.5	69.5	68.5	69.5
Cyclohexanone	20.0	20.0	20.0	20.0	20.0	20.0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Effect						
Test Example 1	Red→ No color	Red→ Pink	Orange → No color	little change	Blue → No color	Blue → light blue
Test Example 2	Red→ No color (After 5 minutes)	Red→ No color (After 10 minutes)	Orange → No color	No change	Blue → No color	No change

Table 1 (Continued)

Composition	Example 5	Comparative Experiment 4	Example 8	Comparative Experiment 5
C.I. Basic Blue 9 (thiazine dye)			0.50	0.50
C.I. Solvent Violet 8 (triarylmethane dye)	0.50	0.50		
Bersamide 756	10.0	10.0		
Denka Butyral #2000-L			10.0	10.0
Nikkol CA-2150	1.0		1.0	
Butyl Cellusorb	68.5	69.5	68.5	69.5
Cyclohexanone	20.0	20.0	20.0	20.0
Total	100.0	100.0	100.0	100.0
Effect				
Test Example 1	Violet → No color	Little change	Blue → No color	little change
Test Example 2	Violet → No color (After 15 minutes)	Violet → No color (After 80 minutes)	Blue → No color	No change

Consideration of Results

With respect to an ink composition comprising methine dye, which was prepared without adding a cationic surfactant (Comparative Experimental Example 1), an incomplete color change occurred upon exposure to ozone. Although a color change occurred upon exposure to hydrogen peroxide gas, the color change took twice as long as the color change that occurred when a cationic surfactant was added to the ink composition (Example 1).

With respect to an ink composition comprising azo dye, which was prepared without adding a cationic surfactant (Comparative Experimental Example 2), a color change hardly occurred upon exposure to both ozone and hydrogen peroxide gas.

With respect to an ink composition comprising thiazine dye, which was prepared without adding a cationic surfactant (Comparative Experimental Examples 3 and 5), a color change hardly occurred upon exposure to both ozone and hydrogen peroxide gas.

With respect to an ink composition comprising triarylmethane dye, which was prepared without adding a cationic surfactant (Comparative Experimental Example 4), a color change hardly occurred upon exposure to ozone. A color change occurred upon exposure to hydrogen peroxide gas; however, the color change took more than five times longer than the color change that occurred when a cationic surfactant was added to the ink composition (Example 5).

Accordingly, it is revealed that the ink composition undergoes a clear color change after exposure to both ozone and hydrogen peroxide gas only when the ink

composition comprises a combination of a cationic surfactant and at least one member selected from the group consisting of azo dye, methine dye, triarylmethane dye and thiazine dye.

6. I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: July 27, 2009 By Seisaku OSHIRO

Seisaku OSHIRO